APPENDIX A:

STATE REGULATIONS ON THE CONTROL OF CONSTRUCTION STORM WATER

Table A-1: State Regulations on the Control of Construction Phase Storm Water

Geographic Area Name	Disturbed Area Limit for Permet Coverage (feet^2)	Numeric Standard or Pollutant Reduction Requirement	Minimum Depth of Runoff or Storm Return Frequency to Treat for Water Quality Management (per acre)	Maximum Allowed Denuded Acreage or Soil Stablilization Requirement	Visual Inspection Frequency	Notes
Clean Water Act NPDES Storm Water program for Phase I and Phase II MS4s	43,560				After 0.5 inch rainfall and every 14 days	Phase II compliance date is March 10, 2003.
CZARA	5,000					Must prepare and implement an approved erosion and sediment control plan or similar document that contains erosion and sediment control provisions.
Alabama	217,800	Turbidity < 50 NTU				
Alaska (AK)	217,800	TSS > 20 microns	2 year / 6 hour		After 0.5 inch rainfall and every 7 days	Inspector must be qualified personnel provided by the discharger.
Arizona	217,800					
Arkansas	217,800		10year / 24hour		Every 7 days	Developers must submit erosion and sediment control plan and storm water pollution prevention plan before filing a notice of intent. Sites 10 acres or more need temporary or permanent sediment basin. Sites less than 10 acres need sediment traps and silt fences.
California (CA)	217,800		2 year / 24 hour		After 0.5 inch rainfall	Inspections will be performed before anticipated storm events, during extended storm events, and after storm events, and once each 24-hour period during extended storm events to identify BMP effectiveness and implement repairs or design changes as soon as feasible depending on field conditions. Discharger is also responsible for inspecting and cleaning all public and private roads for sediment. Construction activities that fall under the jurisdiction of the California Department of Transportation (CALTRANS) have separate permit and regulations.
Colorado (CO)	217,800				Any precipitation or snowmelt event that causes erosion and every 14 days	Storm water management plan must be submitted to state for a 10 day review, as well as be retained on site.
Connecticut	217,800	80% TSS reduction				
Delaware	5,000	80% TSS reduction	0.5 inch			
Florida , DEP, Northern District (only applies in NW Florida)	217,800	80% TSS reduction	0.5 inch*			*>100 acres, 1 inch rainfall, <100 acres, 0.5 inch rainfall.
Florida, South Florida Water Management District (General, Standard General, Noticed General and Individual Permits)	435,600		1 inch			
Florida, Southwest Florida Water Management District	217,800		0.5 inch			
Florida, St. Johns River Water Management District	217,800	Turbidity <29 NTU				
Florida, Suwannee River Water Management District	43,560	80% TSS reduction	1 inch			
Georgia	47,916	Turbidity < 10-25 NTU*	25 year / 24 hour			*<25 nephelometric turbidity units for waters supporting warm water fisheries, or <10 nephelometric turbidity units for waters classified as trout waters.

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Hawaii (HI)	217,800				After 0.5 inch rainfall and every 7 days during dry season, every day during rainy season	Construction shall be phased for large projects; one phase must be stabilized before another can begin. 50 days maximum from destruction of pre-construction conditions to temporary stabilization.
Idaho (ID)	217,800				After 0.5 inch rainfall and every 14 days	
Illinois	217,800		3,600 cubic feet per acre		Every 7 days	
Indiana	217,800				Every 7 calendar days and within 24 hours of 0.5 inch of precipitation	
Iowa	217,800	80% TSS reduction			Every 7 days	
Kansas	217,800				At least once per week	
Kentucky	217,800	Goal of 80 % TSS reduction (compared to pre-construction conditions)				
Louisiana	217,800					
Maine	217,800	40-80% TSS reduction	2 year			
Maryland	5,000	80% TSS reduction*	2 year / 24 hour			*Based on the average annual TSS loading from all storms less than or equal to the 2 year/24 hour storm.
Massachusetts	217,800	80% TSS reduction	2 year / 24 hour			
Michigan	43,560		3,600 cubic feet per acre		Encourage weekly inspections	Sites >10 acres require onsite temporary basin.
Minnesota	217,800		0.5 inch		1 time every 7 days or within 24 hours after a significant rain event which results in runoff leaving a construction site.	
Mississippi	217,800					
Missouri	217,800	Settleable Solids < 0.5 -2.5 mL/L/hour*			Periodic	*2.5 mL/L/hour for normal land disturbance, 0.5 mL/L/hour for land disturbance within sensitive areas.

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Montana (MT)	217,800		2 year / 24 hour		After 0.5 inch rainfall and every 7 days	Dischargers must submit with the state application form a stormwater erosion control plan (SWECP) that resembles EPA's construction site SWPPP. Permit coverage begins only when Montana DEQ reviews and approves SWECP. Must also inspect everyday during prolonged precipitation or snowmelt periods. A registered PE must prepare the ESC plan if site is greater than 20 acres. Also regulate down to 1 acre if construction site within 100 feet of a surface water body. Montana has a sediment and erosion control guidance manual that lists standard use BMPs. If other BMPs are used, they need to be submitted with ESC plan to the state for approval. For slopes steeper than 3:1 and greater than 5 vertical feet, surface roughening is required. Filter fences should be used on drainage areas >1acre; sediment traps should only be used on drainage areas > 3 acres; and temporary sediment ponds should only be used on drainage areas > 10 acres.
NC	43,560	Y		20 acres total disturbance at any given time for areas discharging to high quality waters	Every 7 days	
Nebraska	217,800				Once a month.	
Nevada	217,800					
New Hampshire	100,000					
New Jersey	5,000					
New Mexico	217,800				Y	
New York	217,800		0.5 inch			
North Dakota	217,800				Y	
Ohio	217,800					
Oklahoma	217,800		3,600 cubic feet per acre		Y	A vegetated buffer zone of at least 100 ft must be retained or successfully established between the area disturbed during construction and all perennial or intermittent streams on or adjacent to the construction site. A vegetated buffer zone at least 50 ft wide must be retained or established between the area disturbed during construction and all ephemeral streams or drainages. Treatment volume is the lesser of 3,600 or the runoff volume of a 2 year 24 hour storm.
Oregon (OR)	217,800				Every 7 days, and daily during periods of stormwater runoff and snowmelt runoff; only every 14 days during periods of 7 days or more of non-construction activity.	If site is >20 acres, erosion and sediment control plan must be prepared by a Professional Engineer, or Registered Landscape Architect, or Certified Professional in Erosion and Sediment Control, and plan must be submitted 90 days before construction begins. All permittees must submit an Oregon Land Use Compatibility Statement if they do not already have one on file with Oregon DEQ.
Pennsylvania	217,800		5 year		Y	Basins should drain no quicker than 4 days and no longer than 7 days.

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Rhode Island	217,800	80-90% TSS reduction	10 year			
South Carolina	>87,120	80% TSS reduction	3,600 cu ft / ac		Y	Trapping efficiency is a performance based requirement for any BMPs. The major requirements for storm water control plans are: application, location map, type and location of BMP's, construction sequencing, location of disturbed areas, property line & waters of the state, standard notes, grassing specifications. The minimum required volume for water quality management is 3600 cubic feet for a disturbed area of more than 10 acres. If there is not a sediment basin of 3600 cubic feet and the drainage area is less than 10 acres, then sediment traps, silt fences, or equivalent measures are needed for sideslope and downslope boundaries for the construction area. However, the first 0.5 inch rainfall runoff in a 24-hr period is applicable to the coastal counties only.
South Dakota	217,800		5 year			
Tennessee	217,800				Y	The permittee shall maintain records of checks and repairs.
Texas	217,800		3,600 cubic feet per acre			
Utah (UT)	217,800		24 hour OR 1 inch storm event		Once every 14 days, before anticipated storm events expected to cause significant runoff, and within 24 hours of the end of a storm that is 0.5 inch or greater.	Where sites have been finally or temporarily stabilized, or when runoff is unlikely due to winter conditions, or during seasonal arid periods in arid areas and semi-arid areas inspections shall be conducted at least once every 30 days. 10yr, 24hr storm event for water quality is for 10 acres or greater. For areas less than 10 acres, or where calculations for volume of runoff for disturbed acres is not performed, a sediment basin providing 3600 cubic feet of storage per acre drained or equivalent control measures shall be provided. 1) Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is preclude by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as possible. 2) In arid areas , semi-arid areas, and areas experiencing droughts where the initiation stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.
Vermont	217,800					
Virginia	217,800		3,600 cubic feet per acre		Y	Sediment basins required for sites of 10 acres or more (except those with final stabilization); for sites <10 acres, same units required but only for sideslope and downslope boundaries of construction sites.
Washington (WA), Large Parcel	>43,560		24 hour / 6 month	2 days between October 1 and April 30 (I.e., the wet season); 7 days between May 1 to September 30 (dry season)		

Table A-1: State Regulations on the Control of Construction Phase Storm Water

Geographic Area Name	Disturbed Area Limit for Permet Coverage (feet^2)	Numeric Standard or Pollutant Reduction Requirement	Minimum Depth of Runoff or Storm Return Frequency to Treat for Water Quality Management (per acre)	Maximum Allowed Denuded Acreage or Soil Stablilization Requirement	Visual Inspection Frequency	Notes
Washington (WA), Small Parcel	<43,560		24 hour / 6 month	2 days between October 1 and April 30 (I.e., the wet season); 7 days between May 1 to September 30 (dry season)		
West Virginia	130,680		2 year		Y	
Wisconsin	*217800				Y	
Wyoming (WY)	217,800	Turbidity <10-15 NTU			Inspect every 7 days, except during seasonal shutdowns and during the period following completion of construction but prior to return of the site to "finally stabilized" conditions and termination of coverage, then the site must be inspected every quarter.	

APPENDIX B:

SUPPORTING COST DATA

APPENDIX B: SUPPORTING COST DATA

OVERVIEW

EPA estimated a reference or standard quantity for each costed best management practice (BMP) that could be applied to construction erosion and sediment controls (ESCs) (e.g., 621 feet of silt fence for a 3-acre single-family residential construction site). These reference quantities were set to serve a range of site conditions and slopes consistent with the requirements of the proposed rule. Reference quantities were not varied between ecoregions but were varied in response to alternative levels of management (i.e., regulatory options explored by EPA) as shown in Table B-1. Note that only where values in Table B-1 differ between options and baseline values is there expected to be a change in the cost for site ESCs.

Reference quantities of various ESCs (or construction controls) are listed in Tables B-2 through B-10, along with unit costing and the assumptions used in EPA's compliance cost assessment. Note that for some controls, reference quantities are given in terms of the number of units that will be constructed (i.e., the number of construction entrances anticipated for a certain size site). In addition, where unit costs are nonlinear (i.e., the unit cost varies with the size of the unit), both a design quantity and a number of units per site size class are required to estimate ESC compliance costs. An example of this is sediment basins, where the total volume (the site size in acres times 3,600 cubic feet per acre) is apportioned into a number of installations (i.e., a 70-acre site is estimated to have 2 installations). This process helps ensure that any economies of scale in the calculation of compliance costs are reasonable.

National BMP costs were determined using the following three equations that relate site size class/land use type models to ESC capital, design, and operation and maintenance costs. Note that Table B-11 contains the regional adjustment factors that customize cost estimates for the 19 ecoregions defined by EPA to make its analysis more representative of actual conditions.

Figure B-1 presents a flowchart summarizing the overall costing methodology.

$$TRCC = RAF * \sum_{i=1}^{17} \left(LM * S * N_i * a \left(\frac{Q_i}{N_i} \right)^b \right)$$

TRCC = Total Regional Capital (Installation) Cost for a site size class/land use model
Q_i = Quantity of elements required per installation
N_i = Number of elements required for a single site size class/land use
S = Estimated number of sites in the site size class/land use
a = Multiplier for converting quantity to national average cost in 2000 dollars
b = Exponent for converting quantity to national average cost in 2000 dollars
RAF = Regional adjustment factor for converting national average costs to region-specific costs
LM = Level of management; values between 0 and 2 that indicate the degree of application of the element. A value of 1 indicates the full application of an element based on the reference condition

$$TRDC = RAF * \sum_{i=1}^{17} DF_i * \left(LM * S * N_i * a \left(\frac{Q_i}{N_i} \right)^b \right)$$

TRDC = Total Regional Design Costs
DF_i = Design factor, a multiplier which represents the design cost as a percent of capital costs
Q_i = Quantity of elements required per installation
N_i = Number of elements required for a single site size class/land use
S = Estimated number of sites in the site size class/land use
a = Multiplier for converting quantity to national average cost in 2000 dollars
b = Exponent for converting quantity to national average cost in 2000 dollars
RAF = Regional adjustment factor for converting national average costs to region-specific costs
LM = Level of management; values between 0 and 2 that indicate the degree of application of the element. A value of 1 indicates the full application of an element based on the reference condition

$$TROMC = RAF * \sum_{i=1}^{17} OM_i * \left(LM * S * N_i * a \left(\frac{Q_i}{N_i} \right)^b \right)$$

LM = Level of management; values between 0 and 2 that indicate the degree of application of the element. A value of 1 indicates the full application of an element based on the reference condition.
TROMC = Total Regional Operation and Maintenance Costs
OM_i = Operation and Maintenance factor, a multiplier which represents the annual operation and maintenance cost which ensure proper operation of the element
Q_i = Quantity of elements required per installation
N_i = Number of elements required for a single site size class/land use
S = Estimated number of sites in the site size class/land use
a = Multiplier for converting quantity to national average cost in 2000 dollars
b = Exponent for converting quantity to national average cost in 2000 dollars
RAF = Regional adjustment factor for converting national average costs to region-specific costs
LM = Level of management; values between 0 and 2 that indicate the degree of application of the element. A value of 1 indicates the full application of an element based on the reference condition.

Table B-1. BMP Quantity Adjustment Factors for Baseline and the Proposed Options

Costed Items	Baseline Construction	Option 1— Inspection/ Certification	Option 2—Inspection/ Certification with Codification of CGP
Silt Fence	1.0	1.0	1.0
Runoff Diversion	1.0	1.0	1.0
Construction Phasing	0.0	0.0	0.0
Mulch	1.0	1.0	1.2
Seed and Mulch	0.0	0.0	0.0
Construction Entrance	1.0	1.0	1.0
Stone Check Dam	1.0	1.0	1.0
Sediment Trap	1.0	1.0	1.0
Sediment Pond	1.0	1.0	1.1
E&S Certification	0.0	1.0	1.1
E&S Inspection	0.0	1.0	1.0
Polyacrylamide (PAM)	0.0	0.0	0.2
Alum Treatment	0.0	0.0	0.0
Monitoring of Effluent Quality	0.0	0.0	0.0

Table B-2. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Site size	Feet of Silt Fence				Feet of Diversion Dike			
Acres	Single-family	Multi-family	Com-mercial	Indus-trial	Single-family	Multi-family	Com-mercial	Indus-trial
1	-	-	-	-	-	-	-	-
3	621	722	361	361	621	722	361	361
7.5	1,553	1,143	600	600	1,553	1,143	600	600
25	5,175	3,129	2,087	2,087	5,175	3,129	2,087	2,087
70	14,490	5,238	3,492	3,492	14,490	5,238	3,492	3,492
200	41,400	8,853	5,902	5,902	41,400	8,853	5,902	5,902

Both silt fencing and diversion dike lengths were based on 207 feet per acre on the site.
Costs for new installation of silt fence are based on $0.92/ft length, excluding profit and overhead (R.S. Means, 2000).
Costs for new installation of diversion ditch are based on $0.55/ft length installation, excluding profit and overhead (R.S. Means, 2000).

Table B-3. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Site Size	Mulched Acreage To Control Erosion			
Acres	Single-family	Multifamily	Commercial	Industrial
1	0.0	0.0	0.0	0.0
3	0.8	0.8	0.8	0.8
7.5	1.9	1.9	1.9	1.9
25	6.3	6.3	6.3	6.3
70	17.5	17.5	17.5	17.5
200	50.0	50.0	50.0	50.0

For sites larger than 1acre, mulching is limited to the site acreage times half the percentage of ultimate impervious area as a temporary means to stabilize denuded surfaces. The maximum coverage is set to 25% of the total site acreage. Cost to mulch is set to $0.20 per square yard for materials/installation without overhead and profit (R.S. Means, 2000).

Table B-4. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Site Size	Acres Treated with PAM			
Acres	Single-family	Multifamily	Commercial	Industrial
1	0.00	0.00	0.00	0.00
3	0.84	1.32	1.50	1.50
7.5	2.10	3.29	3.75	3.75
25	7.00	10.96	12.50	12.50
70	19.60	30.70	35.00	35.00
200	56.00	87.72	100.00	100.00

PAM is costed at $200 per acre per treatment based on a survey of commercial vendors and assuming costs are similar to herbicide for soil treatment ($0.04 per square yard without profit and overhead based on spraying from truck). The acreage treated is equal to the site size times the ultimate impervious percentage, to a maximum of 50% of the site size.

Table B-5. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

The Number of Equal Size Units Installed to Provide Required Protection								
Site Size	Number of Stone Check Dam				Number of Sediment Trap			
Acres	Single-family	Multi-family	Com-mercial	Indus-trial	Single-family	Multi-family	Com-mercial	Indus-trial
1	0	0	0	0	0	0	0	0
3	0	0	0	0	1	1	1	1
7.5	10	10	10	10	1	1	1	1
25	35	35	35	35	0	0	0	0
70	50	50	50	50	0	0	0	0
200	100	100	100	100	0	0	0	0

For stone check dam, assume approximately one unit per 5 acres for sites larger than 5 acres at a cost of $45.36 per installation, excluding overhead and profit (Phase II Economic Analysis for Phase II Storm Water Regulations).

Sediment trap of 3,600 cubic feet per acre served at a cost of $0.22 per cubic foot volume (excludes profit and overhead).

Table B-6. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Site Size	Number of Sediment Basins			
Acres	Single-family	Multifamily	Commercial	Industrial
1	0	0	0	0
3	0	0	0	0
7.5	1	1	1	1
25	2	2	2	2
70	2	2	2	2
200	4	4	4	4

Sediment pond of 3,600 cubic feet per acre served. Cost in dollars is computed from the equation:
[0.76 x 7.47 x (volume required, cubic feet/number of ponds per site size)$^{.78}$]
The value of 0.76 removes overhead and profit from cost estimate.

Table B-7. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Site Size	Number of Construction Entrances			
Acres	Single-family	Multifamily	Commercial	Industrial
1	0	0	0	0
3	1	1	1	1
7.5	1	1	1	1
25	1	1	1	1
70	2	2	2	2
200	4	4	4	4

Costs for construction entrance based on $6.92 per square yard (gravel installed) for a footprint covering 100 square yard, excluding profit and overhead (R.S. Means, 2000).

Table B-8. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Administrative BMPs for Erosion and Sediment Control Management				
Site Size	**E&S Site Inspection**			
Acres	**Single-family**	**Multifamily**	**Commercial**	**Industrial**
1	0	0	0	0
3	1	1	1	1
7.5	1	1	1	1
25	2	2	2	2
70	7	7	7	7
200	20	20	20	20

E&S Site Inspection includes multiple site visits by a certified inspector to verify the proper installation and operation of ESC BMPs. Values above are the number of half-day site inspections. Costs are based on 16 hours of inspection/documentation time per 10-acre unit of a site, at a rate of $28.44 per hour.

Table B-9. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Administrative BMPs for Erosion and Sediment Control Management				
Site Size	**E&S Site Certification of Sedimentation Basins**			
Acres	**Single-family**	**Multifamily**	**Commercial**	**Industrial**
1	0	0	0	0
3	1	1	1	1
7.5	1	1	1	1
25	1	1	1	1
70	2	2	2	2
200	4	4	4	4

E&S Site Certification includes multiple site visits by a certified inspector to verify the proper installation of sedimentation basins. Costs based on 2 hours of inspection/documentation by a licensed engineer per 10-acre unit of a site, at a rate of $56.74 per hour.

Table B-10. Quantities of Erosion and Sediment Control Items For Assessing Compliance Costs for the Construction Industry

Site Size	Phasing of Construction			
Acres	Single-family	Multifamily	Commercial	Industrial
1	0	0	0	0
3	0	0	0	0
7.5	0	0	0	0
25	2	2	2	2
70	6	6	6	6
200	19	19	19	19

For sites larger than 10 acres, the number of remobilizations required is based on a maximum of 10 acres denuded at any single time to prevent large unstabilized construction sites. Costs are based on $1,000 per remobilization.

Table B-11. Regional Compliance Cost Adjustment Factors

Region or Ecoregion	Regional Compliance Cost Adjustment Factors
1	0.85456
2	0.98351
3	0.9
4	0.78103
5	0.85711
6	0.85768
7	0.87
8	1.03221
9	0.877
10	0.99576
11	0.81034
12	0.85357
13	0.93573
14	0.9076
15	1.09438
16	1.1285
17	1.05151
18	1.04609
19	1.05169

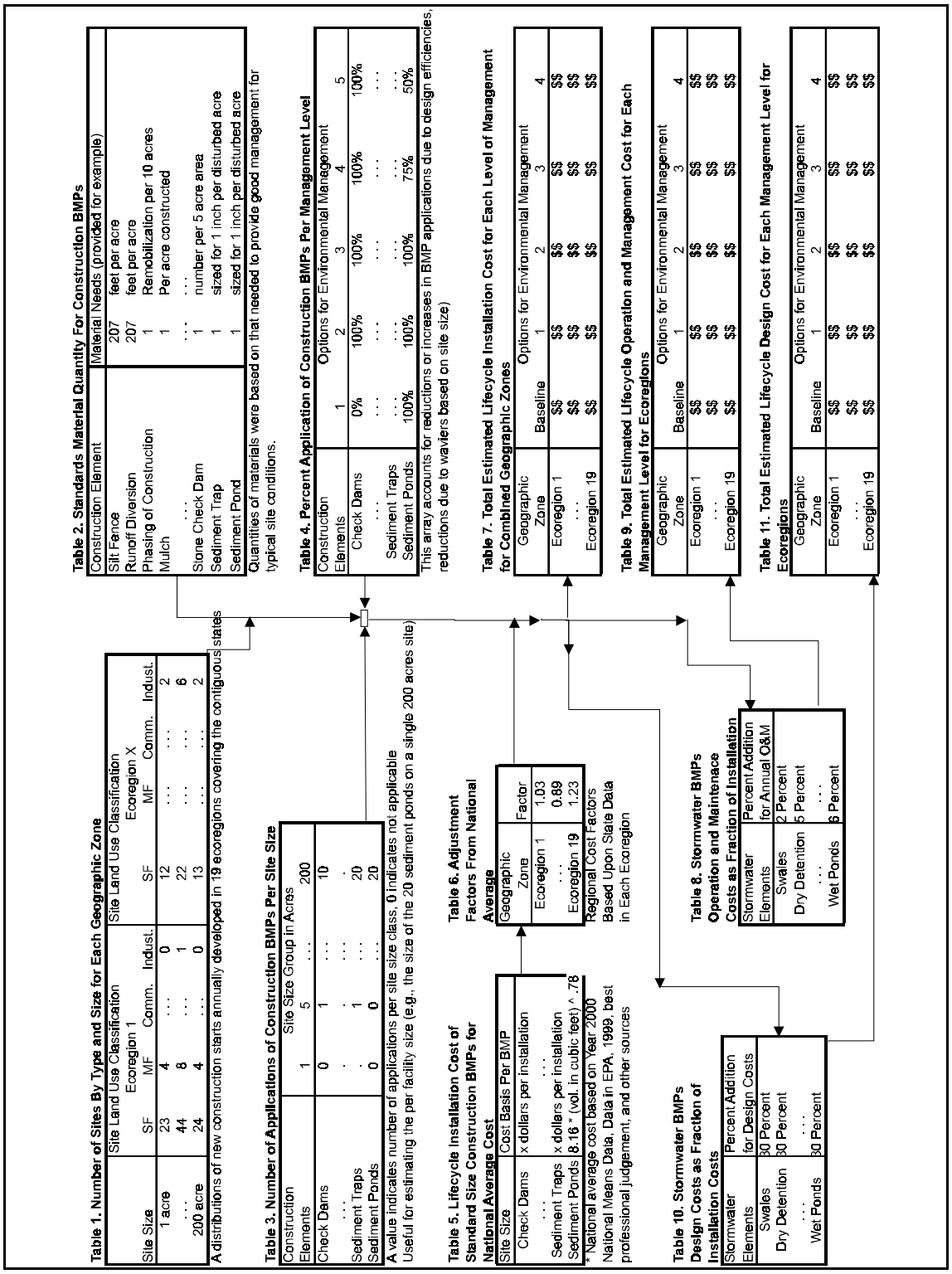

Figure B-1. Overall Costing Methodology